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REMARKS

Entry of this amendment is proper under 37 CFR §1.116, since no new issues or claims are raised.

Claims 1, 2, 4-15, 17, 18, 20-31, 33, 35-46, 48, 50-61, and 63 are all the claims presently pending in the application. Claims 3, 16, 19, 32, 34, 47, 49, and 62 are canceled. Various claims have been amended to more particularly define the invention in accordance with local practice.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicants gratefully acknowledge the Examiner's indication that claims 5, 6, 8, 11, 21, 22, 24, 27, 36, 39, 42, 51, 54, 57, and 63 would be allowable if rewritten in independent format and the indefiniteness rejection were overcome. However, Applicants believe that all claims are allowable over the references currently of record.

The Examiner objects to claims 1, 2, 4-15, 17, 18, 20-31, 33, 35-46, 48, 50-61, and 63. Applicants believe the above claim amendments appropriately address this concern and respectfully request that the Examiner reconsider and withdraw this objection.

Claims 1, 17, 33, and 48 stand rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent Publication No. 2003/0165119 to Hsu et al., further in view of JP 2002-353998 to Yasuaki and US Patent 5,761,435 to Fukuda et al. Claims 4, 12-14, 20, 28-30, 35, 37, 38, 43-45, 50, 52, 53, and 58-62 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hsu/Yasuaki/Fukada et al., and further yet in view of US Patent 6,882,630 to Seaman. Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hsu/Yasuaki/Fukada/Seaman, further yet in view of US Patent 7,061,876 to Ambe. Claims 25, 26, 40, 41, 55, and 56 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hsu/Yasuaki/Fukada, further yet in view of Ambe.

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

As described in, for example, independent claim 1, the claimed invention is directed to a network system for setting a transfer path according to a spanning tree on a network connecting a plurality of nodes. Two different networks are connected by a self-configuring partial network consisting of at least four nodes accommodating no terminal. Each node belonging to the self-configuring partial network configures and manages a spanning tree for every other network adjacent to the self-configuring partial network, according to a spanning tree protocol. Conventional methods of setting up a spanning tree, as discussed beginning at line 13 on page 1 of the disclosure, affect a large area when a spanning tree has to be modified due to a failure.

In contrast, the present invention uses a self-configuring partial network to first configure itself and then configure the attached partial networks, if required, thereby shortening the configuration time.

II. THE PRIOR ART REJECTIONS

The Examiner alleges that Hsu, when modified by Yasuaki and Fukuda, renders obvious the present invention described in claims 1-3, 7, 15-19, 23, 31-34, and 46-49, and, when further modified by Seaman, renders obvious claims 4, 12-14, 20, 28-30, 35, 37, 38, 43-45, 50, 52, 53, and 58-62, and when further yet modified by Ambe, renders obvious claims 35, 26, 40, 41, 55, and 56. The Examiner also considers that Hsu/Yasuaki/Fukada/ Seaman, when further modified by Ambe, renders obvious claims 9 and 10.

Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by Hsu.

The Examiner alleges that Figure 15 demonstrates that Hsu teaches the contents of independent claim 1 except that Hsu fails to suggest having two different networks connected by a self-configuring partial network formed of four nodes, each node for configuring and managing spanning trees. The Examiner relies upon secondary reference Yasuaki to make up this deficiency of Hsu.

However, since Yasuaki is a foreign reference and the Examiner relies upon this foreign reference beyond the contents of the English Abstract, the Examiner is required to provide a complete English translation of Yasuaki (see MPEP §706.02) and is requested to provide such translation in the next Office Action, if this rejection based on Yasuaki is maintained.

However, Applicants attach to this response a machine translation of Yasuaki, as obtained from the Japanese Patent Office website. Paragraphs [0045-0049] of this machine translation would not appear to support the Examiner's contention that each node of ring 41 performs in the manner described in the independent claims and alleged by the Examiner. Therefore, absent additional evidence from the Examiner, Applicants respectfully submit that the rejection currently of record fails to satisfy the initial burden of a *prima facie* obviousness rejection, since secondary reference Yasuaki is not demonstrated to provide the features relied upon.

Applicants respectfully submit that neither primary reference Hsu nor secondary Yasuaki nor any of the other cited references teaches or suggests using a self-configuring partial network having at least four nodes which first configures itself and then configures a spanning tree in any adjacent partial networks. .

If the Examiner maintains this rejection, Applicants request that the Examiner provide in the next Office Action the specific locations in a proper and complete English translation of Yasuaki that would demonstrate support for a self-configuring partial network formed by four (or more) nodes having the capabilities described in the independent claims.

The Examiner relies upon the remaining secondary references for features not related to overcoming this fundamental deficiency in Hsu.

Moreover, Applicants submit that neither Yasuake nor Fukada teaches or suggest a self-configuring partial network.

Hence, turning to the clear language of the claims, in Hsu, even if modified by Yasuaki and Fukada, there is no teaching or suggestion of: "...wherein two different networks are connected by a self-configuring partial network comprising at least four nodes accommodating no terminal, and each node belonging to said self-configuring partial network configures and manages a spanning tree for every other network adjacent to the self-configuring partial network ...", as required by independent claim 1. The remaining independent claims have similar language or concepts.

Moreover, Applicants submit that the rejection of record fails to articulate reasonable rationales to modify Hsu, since the Examiner merely provides conclusory statements of purported benefits and is clearly using the claimed invention as a roadmap.

Relative to the rejection for claims 4, 12-14, 20, 28-30, 35, 37, 38, 43-45, 50, 52, 53, and 58-62, Applicants submit that the LLC entity 109 of Figure 1 of Seaman does not reasonably constitute a virtual port. Nor does this LLC entity 109 interconnect between a tree

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manager and a transfer unit, as shown in Figure 2 of the present application.

Therefore, Applicants submit that there are elements of the claimed invention that are not taught or suggest by Hsu. Therefore, the Examiner is respectfully requested to withdraw these rejections.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1, 2, 4-15, 17, 18, 20-31, 33, 35-46, 48, 50-61, and 63, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 06/16/08

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CERTIFICATION OF TRANSMISSION

I certify that I transmitted via facsimile to (571) 273-8300 this Amendment under 37 CFR §1.116 to Examiner B. Lee on June 16, 2008.

Frederick E. Cooperrider
Reg. No. 36,769

Machine Translation of JP 2002-353998 (15 pages)

[JP,2002-353998,A]

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

[JP,2002-353998,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

(1)

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the spanning tree construction system in the network system to which interconnection of between two or more networks was especially carried out by the bridge about the network system and spanning tree constructing method which used a communication apparatus and it.
[0002]
[Description of the Prior Art]The bridge network using the conventional spanning tree is explained with reference to drawing 7 and drawing 10. In the network shown in drawing 7, the bridge 1, the bridge 3, and the bridge 4 are mutually connected by LAN A, respectively. The bridge 1, the bridge 2, and the bridge 5 are mutually connected by LAN B, respectively. The bridge 2, the bridge 3, and the bridge 4 are mutually connected by LAN C, respectively.
[0003]The bridge 5, the bridge 6, the bridge 8, and the bridge 9 are mutually connected by LAN D again, respectively. The bridge 7, the bridge 8, and the bridge 9 are mutually connected by LAN E, respectively, and the bridge 6 and the bridge 7 are mutually connected by LAN F.
[0004]Each bridge to the bridges 1-9 is provided with the function to build a spanning tree, by exchanging the configuration bridge Protocol Data Unit (C-BPDU) specified by IEEE802.1d. Drawing 10 shows the state of the spanning tree built as a result of the exchange of this CBPDU.
[0005]In drawing 10, the bridge 1 is determined as a root bridge and the dotted line shows the built spanning tree. Thus, transmission of a data packet is performed, without generating a loop by building a spanning tree on the network of two or more LAN connected on the bridge.
[0006]In drawing 7 and drawing 10, "bridge ID" is an identification number for identifying a bridge, and "port ID" is an identification number of each port. "Root run cost" and a "path cost" are values which show the ease of reaching to a root bridge, It is that to which the value of the path cost set as the bridge (port) whenever a spanning tree is built and it goes via a bridge is added, This root run cost and path cost are used as a parameter so that the bridge (port) with which route PASUKOTO becomes small most (it is easy to reach) may be chosen.
[0007]
[Problem(s) to be Solved by the Invention]However, the following technical problems occur in the conventional spanning tree. If the link between a certain bridges is lost by the obstacle of the bridge which constitutes a network, or the obstacle of the network which connects between bridges, reconstruction of a spanning tree will be performed by regulation of IEEE802.1d. When this reconstruction is performed, all the filtering databases currently learned for the spanning tree configuration information built till then and the FO wording of a data packet will be initialized, and construction of a tree will newly be performed.
[0008]The data packet which should be transmitted on a network will not be transmitted, but will

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fall into the same state as discontinuation of service until it requires considerable time according to the number of the bridges which constitute the reconstruction network of this tree and reconstruction is completed. a bridge network -- large -- becoming (the number of the bridges which constitute a network increases) -- this situation becomes remarkable.

[0009]When a network and its configuration equipment have an obstacle, the purpose of this invention, It is providing the network system and spanning tree constructing system using the communication apparatus and it which minimize the range which restores an obstacle early more and, to which reconstruction of a tree is carried out, and were made to lessen service interruption as much as possible, and its method.

[0010]

[Means for Solving the Problem]A communication apparatus by this invention is characterized by carrying out two or more owners of the spanning tree management tool which manages a spanning tree within **** and said two or more networks with a communication apparatus for carrying out interconnection of between two or more networks. And each of said spanning tree management tool, Bridge ID which is the identification information for spanning tree management beforehand is given individually, It is characterized by including a control means which assigns and controls said two or more spanning tree management tools to two or more ports which are characterized by performing spanning tree construction procedure using this bridge ID, and serve as an interface with each of said network.

[0011]And said control means is characterized by a quota state of said two or more ports and two or more of said spanning tree management tools making said quota control with reference to a table stored beforehand, Each of said spanning tree management tool, By exchanging a bridge Protocol Data Unit (BPDU) with other communication apparatus, perform said spanning tree construction procedure and said control means, A port which received said bridge Protocol Data Unit is characterized by determining which spanning tree management tool it is assigned with reference to said table.

[0012]A network system by this invention is a communication apparatus which carries out interconnection of between two or more networks and networks, such as this, an included network system, and said communication apparatus, It is characterized by carrying out two or more owners of the spanning tree management tool which manages a spanning tree within said two or more networks.

[0013]A spanning tree constructing method by this invention Two or more networks, It is a spanning tree constructing method in a network system containing a communication apparatus which carries out two or more owners of the spanning tree management tool for carrying out interconnection of between networks, such as this, and managing a spanning tree, In each of said spanning tree management tool, it is characterized by including a step which performs spanning tree construction procedure using bridge ID which is the identification information beforehand given individually for said spanning tree management.

[0014]And said spanning tree construction procedure, It is characterized by performing by exchanging a bridge Protocol Data Unit (BPDU) with other communication apparatus, and

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reception of said bridge Protocol Data Unit is answered, It is characterized by including further a step which which spanning tree management tool a port which received this bridge Protocol Data Unit is assigned determines with reference to a table specified beforehand.

[0015]A program by this invention is a program for making a computer perform motion control of a communication apparatus for carrying out interconnection of between two or more networks, It is characterized by including a control step which assigns and controls two or more spanning tree construction procedure to two or more ports used as an interface with each of said network. And said control step is characterized by a quota state of said two or more ports and two or more of said spanning tree construction procedure making said quota control with reference to a table stored beforehand. Each of said spanning tree construction procedure, By exchanging a bridge Protocol Data Unit (BPDU) with other communication apparatus, perform and said control step, A port which received said bridge Protocol Data Unit is characterized by determining which spanning tree construction procedure it is assigned with reference to said table.

[0016]An operation of this invention is described. In bridged LAN which comprises two or more LAN, without dividing LAN segments, by defining two or more spanning trees in one bridge, it constitutes so that a spanning tree may be divided. Therefore, provide two or more Management Department for managing a span NINGU tree within one bridge, and two or more ports used as an interface with each of LAN are received, It has composition which assigns two or more Management Department flexibly, and presupposes that it is controllable, and gives bridge ID independent for span NINGU tree management to these each Management Department. By this, each Management Department can perform construction processing of a span NINGU tree independently, and within the same LAN segments, It becomes possible to divide a spanning tree into plurality flexibly, and bridged LAN in which two or more spanning trees exist within the same LAN segments can be constituted.

[0017]

[Embodiment of the Invention]The example of this invention is described to it, referring to drawings to below. Drawing 1 is a key map showing the outline of the span NINGU bridge of the example of this invention. In drawing 1, the bridge carries two or more spanning tree Management Department which can manage one spanning tree, The port (thing for interfacing LAN) which each spanning tree Management Department 31-3m (m is two or more integers) should manage by setting out from the outside (network administrator etc.) is assigned to each.

[0018]

[0019]Therefore, the port versus spanning tree Management Department quota table 22 shall be formed, and the quota state shall be beforehand set up by the network administrator,etc. from the outside at the time of a system design. To which spanning tree Management Department CPU(control section) 21 distributes C-BPDU (called CBPDU) received from two or more port #1-#n (n is two or more integers). It determines with reference to this table 22, and the receiving C-BPDU concerned is supplied to this determined spanning tree Management Department.

[0020]Between each port and CPU21, the frame processing parts 11-1n for processing a

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receiving data frame, receiving C-BPDU, and the transmitting data frame and transmitting C-BPDU to each port from each port are formed. The state where drawing 2 shows the example of the contents of the port versus spanning tree Management Department quota table 22, and port #1 is assigned to spanning tree Management Department #1 in this example, and port #2 and #3 are assigned to spanning tree Management Department #3 is shown.

[0021]Drawing 3 is a block diagram showing the composition of the frame processing part 11, and its other frame processing parts [12-1n] composition is also completely equivalent. In drawing 3, the frame processing part 11 shows as what is assigned to the spanning tree Management Department 31 by CPU21, and is omitting CPU21.

[0022]In drawing 3, the frame reception part 51 receives the frame from a port, if it is the usual data frame, it will supply this to the frame transmission control department 53, and if it is C-BPDU, it will supply this to the C-BPDU trailer 52. The frame transmission control department 53 controls [which passes the reception frame from the frame reception part 51 to the frame transmission part 55 with reference to the contents of the port information table 54, and relays a frame / or or] whether it discards. The port information table 54 is a table where the port status of port #1 stores Alter NETO port (Alternate Port) or the DEJIGUNEITEDDO port (Designated Port).

[0023]The frame transmission part 55 transmits C-BPDU from a data frame or the C-BPDU generation part 56 relayed from the frame transmission control department 53 to port #1.Port ID / port path cost table 57 stores the path cost which is ID and the parameter of port #1 concerned. The C-BPDU trailer 52 receives and carries out termination processing of C-BPDU from the frame reception part 51, and can distribute this C-BPDU by which the termination was carried out by CPU21 (refer to drawing 1) to the spanning tree Management Department 31 assigned to port #1. The C-BPDU generation part 56 generates C-BPDU, when directed by the spanning tree Management Department 31.

[0024]The spanning tree Management Department 31 (the same may be said of other spanning tree Management Department), It is what performs spanning tree protocol construction procedure individually using C-BPDU in which the termination was carried out by the C-BPDU trailer 52, Therefore, the above-mentioned procedure is performed with reference to the table 58 which stored bridge ID / root run cost, and the port ID / port path cost table 57.

[0025]Drawing 4 is what shows the example of a format of C-BPDU for spanning tree construction, "BPDU TYPE" shows that this unit is C-BPDU, recognizes that a reception frame is C-BPDU by this, and outputs a reception frame to the C-BPDU trailer 52 of the next step.

[0026]In a spanning tree, "route ID" is a bridge number of the bridge used as a root bridge, and "root run cost", As mentioned above, it is a value which shows the ease of reaching to a root bridge, and "bridge ID" is the number given to the bridge and "port ID" is a port number (#). Since this invention in particular is not related about other parameters, explanation is omitted, but the details of this format are specified to IEEE802.1d.

[0027]Each spanning tree Management Department 31-3m builds management of the state of the port belonging to each Management Department, and the spanning tree within each LAN connected to those ports based on IEEE802.1d according to C-BPDU which received from the assigned port which should be managed. The spanning tree Management Department 31-3m operates independently, respectively, and does not affect it to other spanning tree Management Department.

[0028]Thus, in this invention, since management can perform two or more spanning trees independently within one bridge, It becomes possible to divide a spanning tree into plurality within the same LAN segments, and bridged LAN in which two or more spanning trees exist within the same LAN segments can be constituted.

[0029]Here, if drawing 7 is referred to, drawing 7 shows the network to which two or more LAN was connected on the bridge. In drawing 7, the bridge 1, the bridge 3, and the bridge 4 are mutually connected by LAN A, respectively, and the bridge 1, the bridge 2, and the bridge 5 are mutually connected by LAN B, respectively.

[0030]The bridge 2, the bridge 3, and the bridge 4 are mutually connected by LAN C, respectively, and the bridge 5, the bridge 6, the bridge 8, and the bridge 9 are mutually connected by LAN D, respectively. The bridge 7, the bridge 8, and the bridge 9 are mutually connected by LAN E, respectively, and the bridge 6 and the bridge 7 are mutually connected by LAN F.

[0031]Bridge ID, port ID, and the path cost (Path Cost) (root run cost is also included) are given to the bridges 1-9 by the network administrator etc. Drawing 7 shows the example of each value in the figure. Here, the bridge 5 shows the bridge which carries two or more spanning tree Management Department 31-3m which showed by drawing 1. In the example of this figure, it is set up by the network administrator etc. so that the one spanning tree Management Department may manage the port suitable for the upper part of the bridge 5 and other one spanning tree Management Department may manage the port suitable for the lower part. Therefore, two bridge ID is independently defined as the bridge 5 for these each spanning tree management.

[0032]In the network shown in this drawing 7, by this invention, two or more spanning trees will be built and two spanning tree domains (1 of a dotted line and 2 show) will be built by drawing 8 with the bridge 5. The outline of this construction procedure is shown in the flow of drawing 5. Each bridge's start of operation will start sending out and reception of C-BPDU for spanning tree construction. Each information on root bridge ID, root run cost, and bridge ID is included in this C-BPDU. Thereby, construction of a spanning tree is started.

[0033]If reception of C-BPDU is made in a certain port at this time (Step S100), based on the port where this C-BPDU was received, CPU21 will determine the spanning tree Management Department with reference to the quota table 22 (Step S101). This C-BPDU can distribute to the determined spanning tree Management Department (Step S102), and spanning tree construction procedure which is spanning tree management processing at this spanning tree Management Department is performed (Step S103).

[0034]As mentioned above, it performs according to the detailed flow which consists of Steps S1-S15 shown in drawing 6 based on regulation of IEEE802.1d, but since this spanning tree construction procedure is common knowledge, it is carried out to describing that outline. First, since the root bridge is not determined, each bridge starts operation noting that he is a root bridge

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respectively, it sets root run cost to 0 by setting root bridge ID to one's ID, and transmits C-BPDU. At this time, C-BPDU is sent out to root bridge ID= bridge ID=97 port ID2 side with each value of root bridge ID= bridge ID=70 on the bridge 5 (refer to drawing 7) in the port by the side of port ID1.

[0035]Then, in each bridge, the following judgments are made by the information on C-BPDU (Step S1) and their bridge ID which received from each port. He becomes a root bridge when root bridge ID of C-BPDU of which port which has received is also larger than its bridge ID (Step S2) (Step S3).

[0036]When it is not a root bridge (step S4);

- When - root bridge ID with smaller root bridge ID which received is the same, When - route ID with smaller root run cost and root run cost are the same, bridge ID determines the port which has received C-BPDU which fulfills the monograph affair of smaller ** as a route port (Step S10).

[0037]And the bridge equivalent to root bridge ID of the C-BPDU which has received is made into a root bridge, Root bridge ID of C-BPDU to send out is updated to this value, the value which added the path cost set as itself to the value of the root run cost included in the same C-BPDU is updated as a new root run cost value, and new C-BPDU is transmitted to ports other than a route port.

[0038]Repeat these operations and eventually the port which is continuing transmitting C-BPDU The DEJIGUNEITEDDO port (Designated Port) (Step S14), A spanning tree is built by what (Step S15) ports other than the route port which is continuing receiving C-BPDU are determined as the Alter NETO port (Alternate Port) for.

[0039]Since root bridge ID of all the C-BPDU which receives on the bridge 1 by these operations as shown in drawing 8 is larger than bridge ID set as the bridge 1, it is determined that the bridge 1 is a root bridge. In the bridges 2-5, since root bridge ID contained in C-BPDU which receives from the bridge 1 is the smallest, the port (port ID1 of each bridge) which faces to the bridge 1 is determined as a route port, respectively.

[0040]Among the bridges 2, 3, and 4 connected by LAN C, in order that the port 2 of the bridge 4 with the smallest root run cost may continue transmitting C-BPDU to the last, it becomes the appointed port (Designated Port). On the contrary, the port 2 of the bridges 2 and 3 turns into the Alter NETO port (Alternate Port) in order to continue receiving C-BPDU.

[0041]In the bridge 5, the one spanning tree Management Department in the bridge 5 manages C-BPDU received in the port 1, and it does not influence the port 2 side defined as another spanning tree Management Department within the bridge 5. Therefore, the termination of the spanning tree which makes the bridge 1 a root bridge is carried out only by the port 1 side of the bridge 5. However, the exchange of C-BPDU explained previously is performed also within the network which comprises the bridges 6-9 connected to the port 2 of the bridge 5. In the example of drawing 7, the spanning tree which makes the bridge 7 a root bridge is constituted (the dotted line of drawing 8 shows the result of spanning tree construction).

[0042]Also in this case, since the spanning tree information by C-BPDU by the side of the port 2

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of the bridge 5 does not influence the port 1 side, the termination of the spanning tree which makes the bridge 7 a root bridge is carried out on the bridge 5.

[0043]Similarly, between the bridges 5-9, another spanning tree protocol will operate, a root bridge will be determined in the bridges 5-9 (here, it is considered as the bridge 6), and another spanning tree which carried out the root bridge origin will be constituted. Two or more spanning trees will be constituted in the same segment by these things.

[0044]As other examples of this invention, the example of application to a ring network is shown. Although bridged LAN was geographically closed in the narrow range and it was constituted conventionally, since it is network broadband-ization, improvement in the speed and broadening are demanded more. The ring network has been widely used for the wide area network from the ease of the conservativeness, and the merit of hindrance avoidance nature.

[0045]Drawing 9 arranges a bridge to ring shape, and the three rings 41-43 show the network by which interconnection is carried out on the bridge A and the bridge B. In drawing 9, operation between the ring 41 and 42 is explained first. The ring 41 comprises the bridge B which is a node with the bridge A which is a node with the bridge 1-1 to 1-4, and the ring 42, and the ring 43, and each bridge is connected by 1:1 and it constitutes the bridge network of ring shape.

[0046]The ring 42 comprises the bridge A (in the port used in the ring 41, another port is used) which is a node with the bridge 2-1 to 2-5, and the ring 41, and each bridge is connected by 1:1 and it constitutes the bridge network of ring shape.

[0047]Here, the bridge A comprises a bridge of this invention. The bridge A has four ports and one of the spanning tree Management Department is defined to two ports which constitute the ring 41. Two ports of everything but the bridge A constitute the ring 42, and spanning tree Management Department where these two ports are another is defined from a network administrator etc. Thereby, within the ring 41 and 42, the respectively different spanning tree protocol will operate, and as the thick line showed in drawing 9, each spanning tree 111,112 is constituted in the ring 41 and 42.

[0048]Similarly, the bridge B is constituted between the rings 41 and 43 by the bridge by this invention. Another spanning tree 113 will be constituted also within the ring 43 by performing the same operation as between the rings 41 and 42 also in here.

[0049]Thus, in this example, since spanning tree topology has closed in a certain network group (here ring), reconstruction of the spanning tree by the obstacle generated within one network group will not spread in other network groups. Service within the network group to which reconstruction is not performed is also is not interrupted.

[0050]As for the operation flow shown in drawing 5 and drawing 6, it is needless to say that it is realizable by making it perform, storing in read-only storages, such as ROM, as a program beforehand, and making a computer read this. Although LAN was described as an application network, it can apply also to a general network, without being limited to this. Therefore, the bridge shown in drawing 1 is also widely applicable to a communication apparatus including the bridge function of a data link layer.

[0051]

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[Effect of the Invention]As explained above, according to this invention, an effect which is indicated below is done so. Since the 1st effect is dividing the spanning tree constituted in networks, such as LAN of the same segment, for example, the number of the whole bridges which constitute one spanning tree decreases. It is that reconstruction of the spanning tree by an obstacle etc. is performed more at a high speed by this in arbitrary parts.
[0052]Since the 2nd effect is dividing the spanning tree constituted in the network, it is being able to continue without minimizing the range of an obstacle and interrupting service within the limits of a spanning tree unrelated to tree reconstruction.
[0053]Since the 3rd effect enables it to control flexibly the method of assigning of two or more ports and two or more spanning tree Management Department, it is being able to build the spanning tree which became independent for every ring with the bridge which connects two or more ring networks.

[Translation done.]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of the bridge of the example of this invention.
[Drawing 2]It is a figure showing the example of the port versus spanning tree Management Department quota table of drawing 1.
[Drawing 3]It is a block diagram showing the example of the frame processing part of drawing 1.
[Drawing 4]It is a format figure of C-BPDU.
[Drawing 5]It is an outline operation flow figure of this invention.
[Drawing 6]It is a flow chart showing the details of spanning tree construction procedure.
[Drawing 7]It is an example of network composition in the example of this invention.

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[Drawing 8]In the network composition of drawing 7, it is a figure showing the example in the case of building a span NINGU tree.

[Drawing 9]It is a figure showing the example of span NINGU tree construction by other examples of this invention.

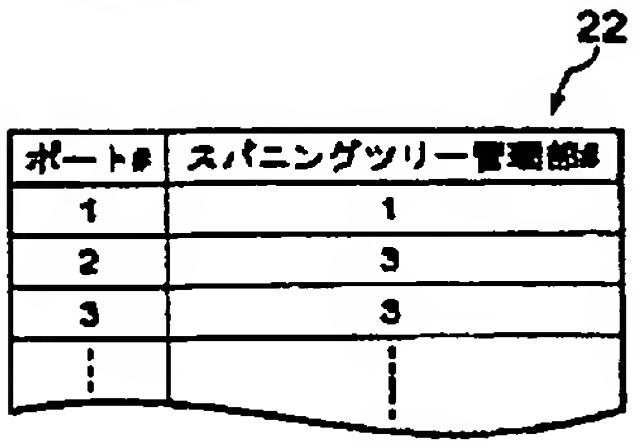
[Drawing 10]It is a figure for explaining conventional technology.

[Description of Notations]

A-F LAN
1-9 Bridge
11-1n frame processing part
21 CPU
22 Port versus spanning tree Management Department quota table
31-3m Spanning tree Management Department
51 Frame reception part
52 C-BPDU trailer
53 Frame transmission control department
54 Port information table
55 Frame transmission part
56 C-BPDU generation part
57 Port ID / port path cost table
58 Bridge ID / root run cost table

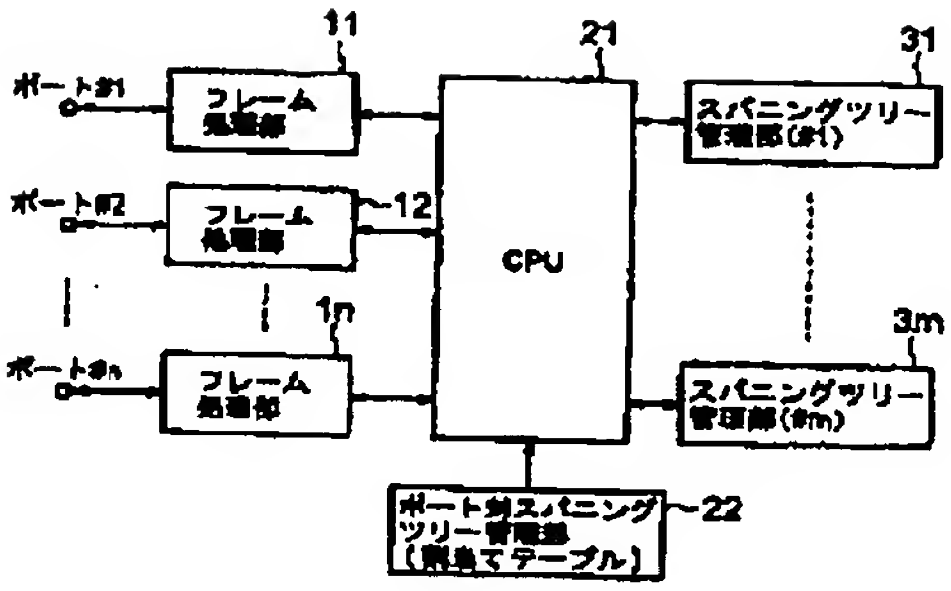
[Translation done.]

[Drawing 2]

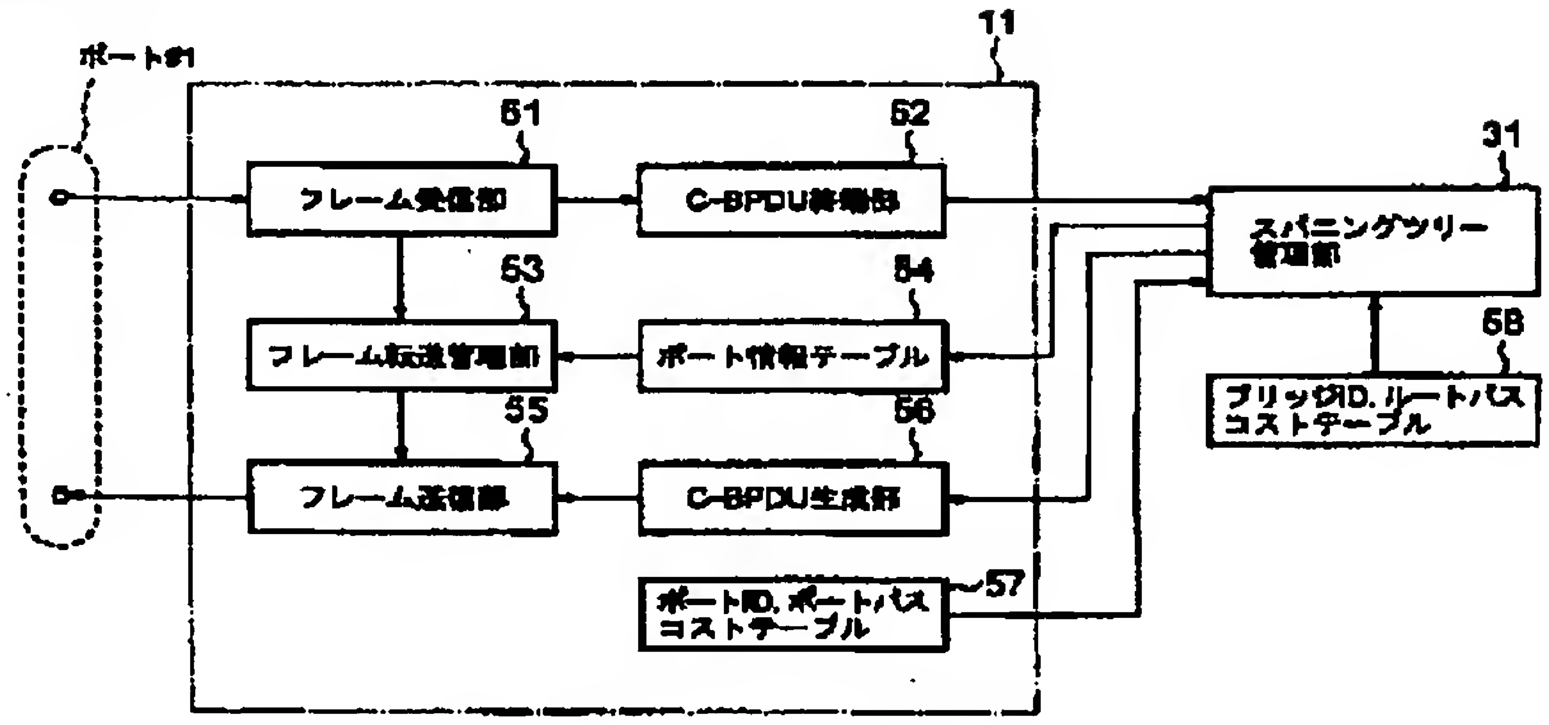


ポート#	スパニングツリー管理部#
1	1
2	3
3	3
⋮	⋮

[Drawing 1]

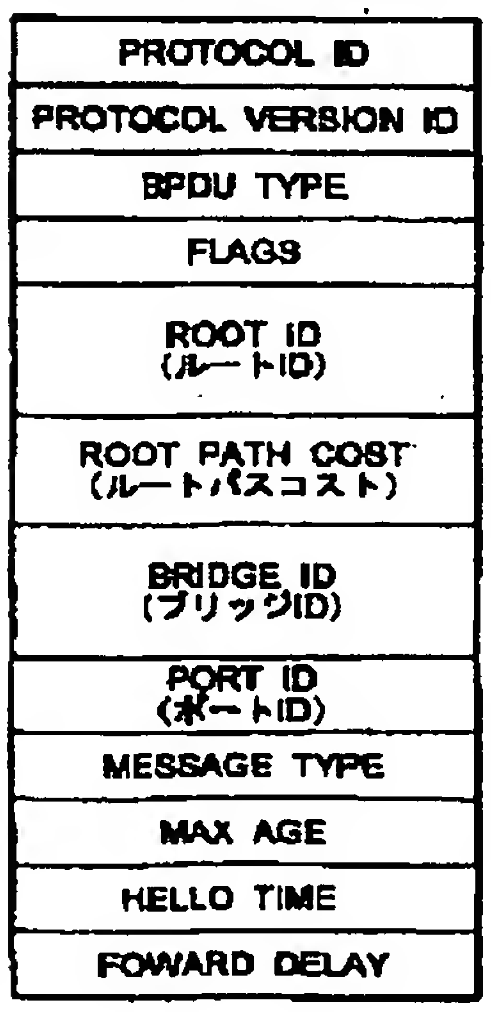

ポート#1
ポート#2
ポート#n
11
12
1n
フレーム処理部
フレーム処理部
フレーム処理部
21
CPU
31
スパニングツリー管理部(#1)
3m
スパニングツリー管理部(#m)
ポート対スパニングツリー管理部（割当てテーブル）
22

[Drawing 3]


ポート#1
11
51
フレーム受信部
52
C-BPDU終端部
53
フレーム転送管理部
54
ポート情報テーブル
55
フレーム送信部
56
C-BPDU生成部
57
ポートID, ポートパスコストテーブル
31
スパニングツリー管理部
58
ブリッジID, ルートパスコストテーブル

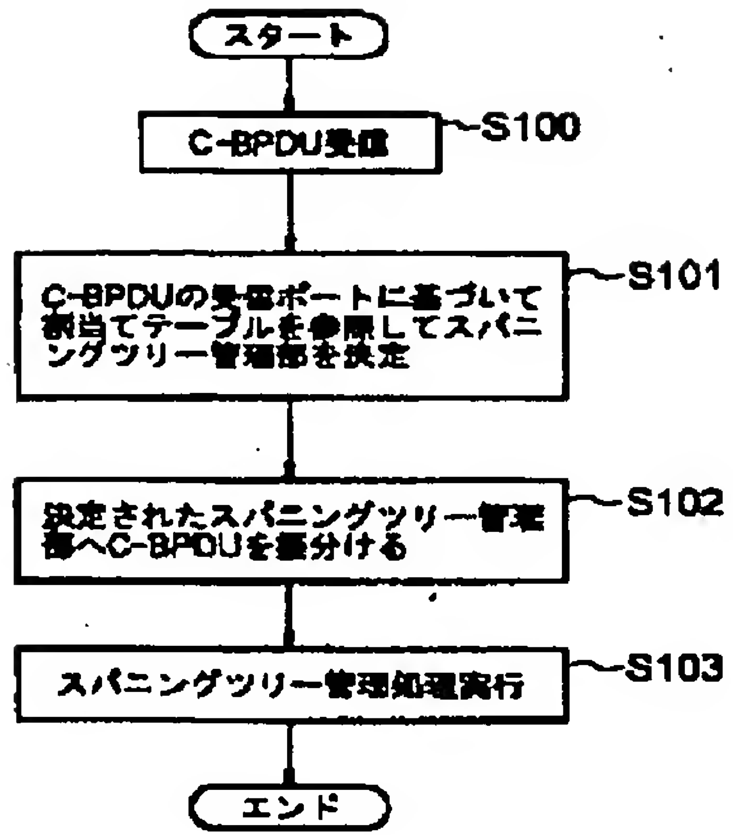
[Drawing 4]

C-BPDUのフォーマット

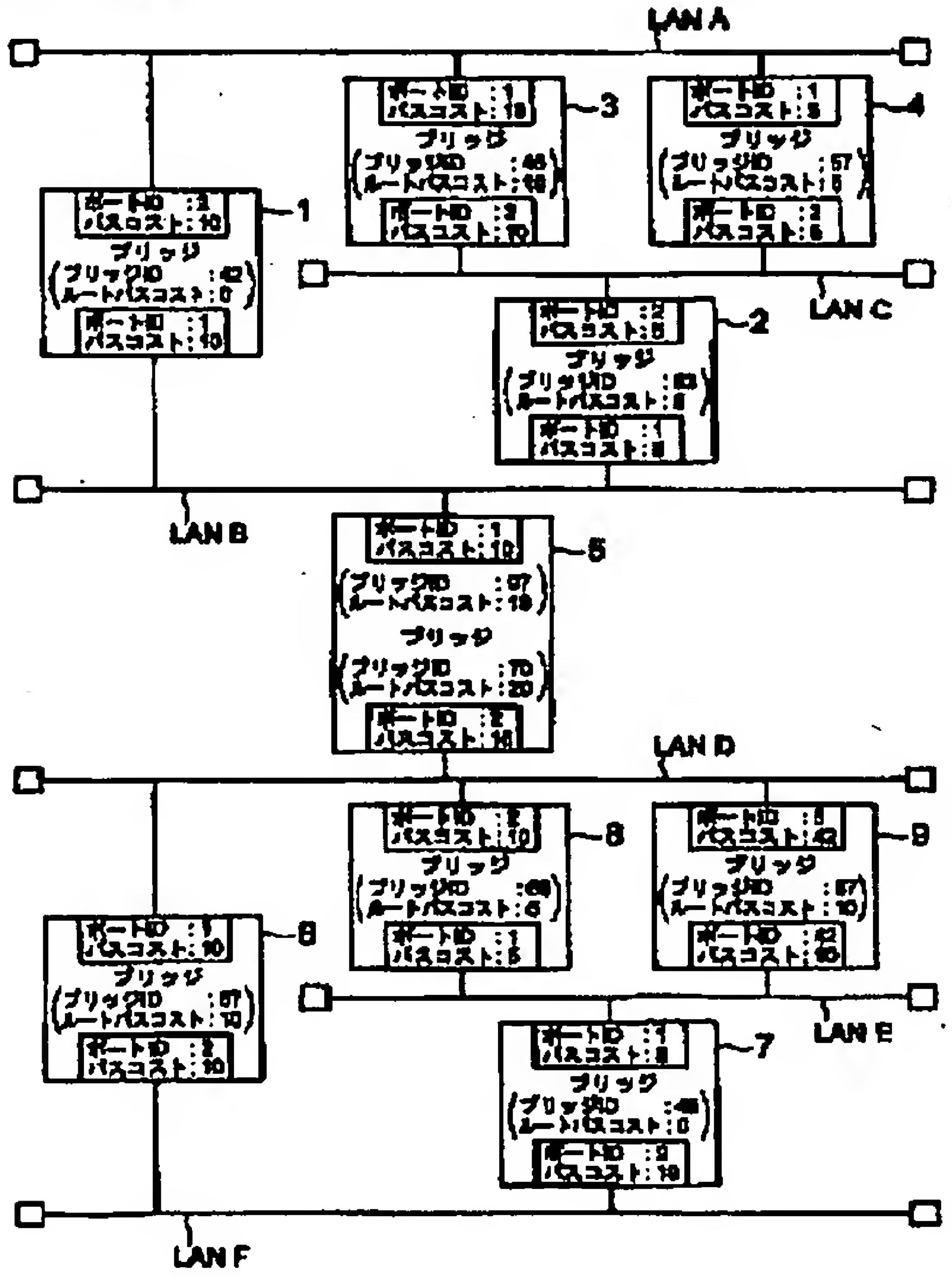


PROTOCOL ID
PROTOCOL VERSION ID
BPDU TYPE
FLAGS
ROOT ID (ルートID)
ROOT PATH COST (ルートパスコスト)
BRIDGE ID (ブリッジID)
PORT ID (ポートID)
MESSAGE TYPE
MAX AGE
HELLO TIME
FOWARD DELAY

[Drawing 5]

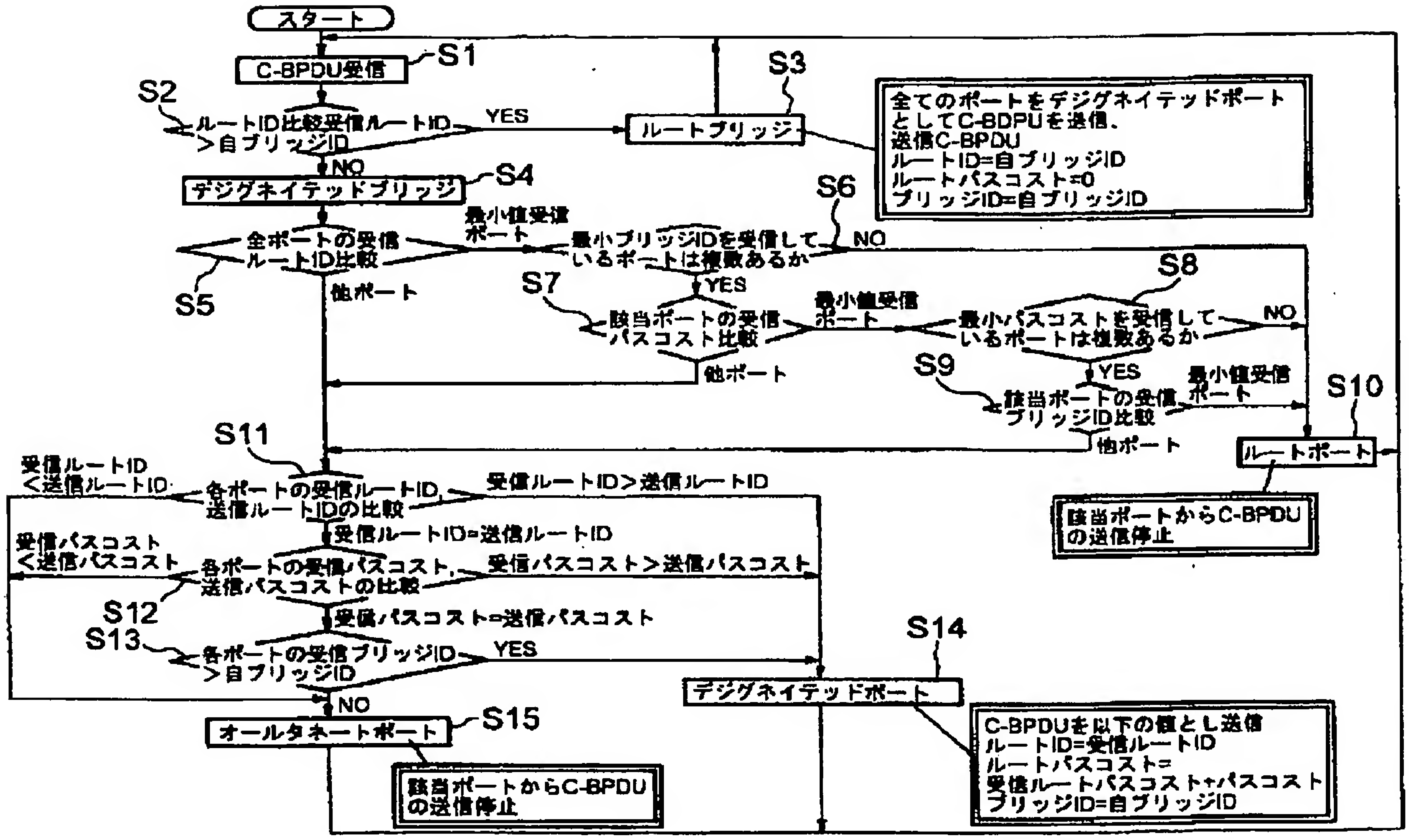

スタート
C-BPDU受信
S100
C-BPDUの受信ポートに基づいて割当てテーブルを参照してスパニングツリー管理部を決定
S101
決定されたスパニングツリー管理部へC-BPDUを振分ける
S102
スパニングツリー管理処理実行
S103
エンド

[Drawing 7]

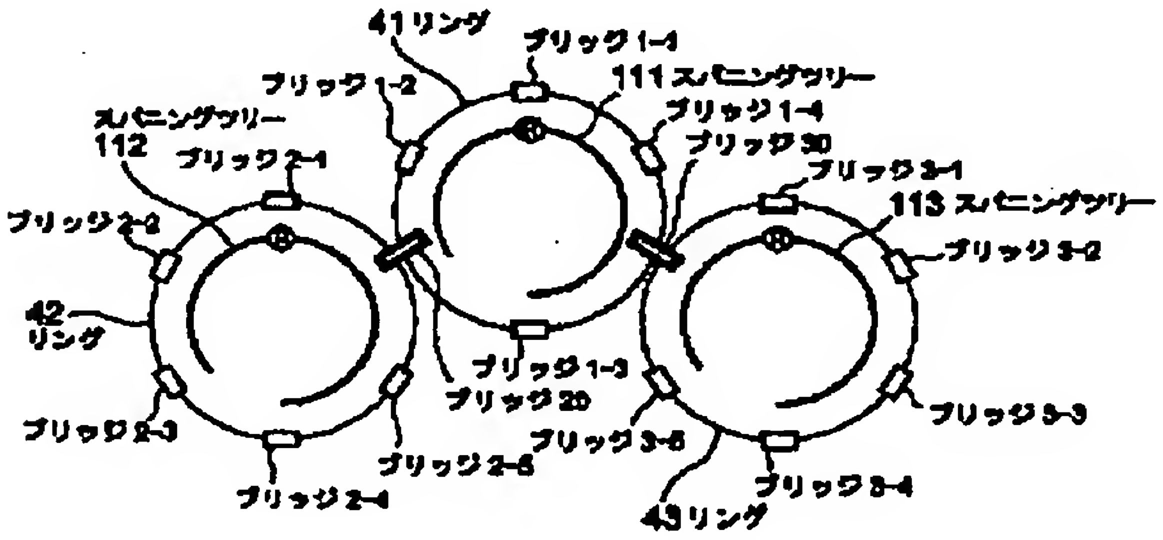

LAN A
ポートID :1
パスコスト:10
ブリッジ
ブリッジID :48
ルートパスコスト:10
ポートID :2
パスコスト:10
3
ポートID :1
パスコスト:5
ブリッジ
ブリッジID :57
ルートパスコスト:5
ポートID :2
パスコスト:5
4
ポートID :2
パスコスト:10
ブリッジ
ブリッジID :42
ルートパスコスト:0
ポートID :1
パスコスト:10
1
LAN C
ポートID :2
パスコスト:5
ブリッジ
ブリッジID :80
ルートパスコスト:5
ポートID :1
パスコスト:5
2
LAN B
ポートID :1
パスコスト:10
ブリッジID :97
ルートパスコスト:10
ブリッジ
ブリッジID :70
ルートパスコスト:20
ポートID :2
パスコスト:10
5
LAN D
ポートID :2
パスコスト:10
ブリッジ
ブリッジID :68
ルートパスコスト:5
ポートID :1
パスコスト:5
8
ポートID :5
パスコスト:42
ブリッジ
ブリッジID :87
ルートパスコスト:10
ポートID :42
パスコスト:10
9
ポートID :1
パスコスト:10
ブリッジ
ブリッジID :87
ルートパスコスト:10
ポートID :2
パスコスト:10
6
LAN E
ポートID :1
パスコスト:5
ブリッジ
ブリッジID :48
ルートパスコスト:0
ポートID :2
パスコスト:10
7
LAN F

[Drawing 6]

(12)

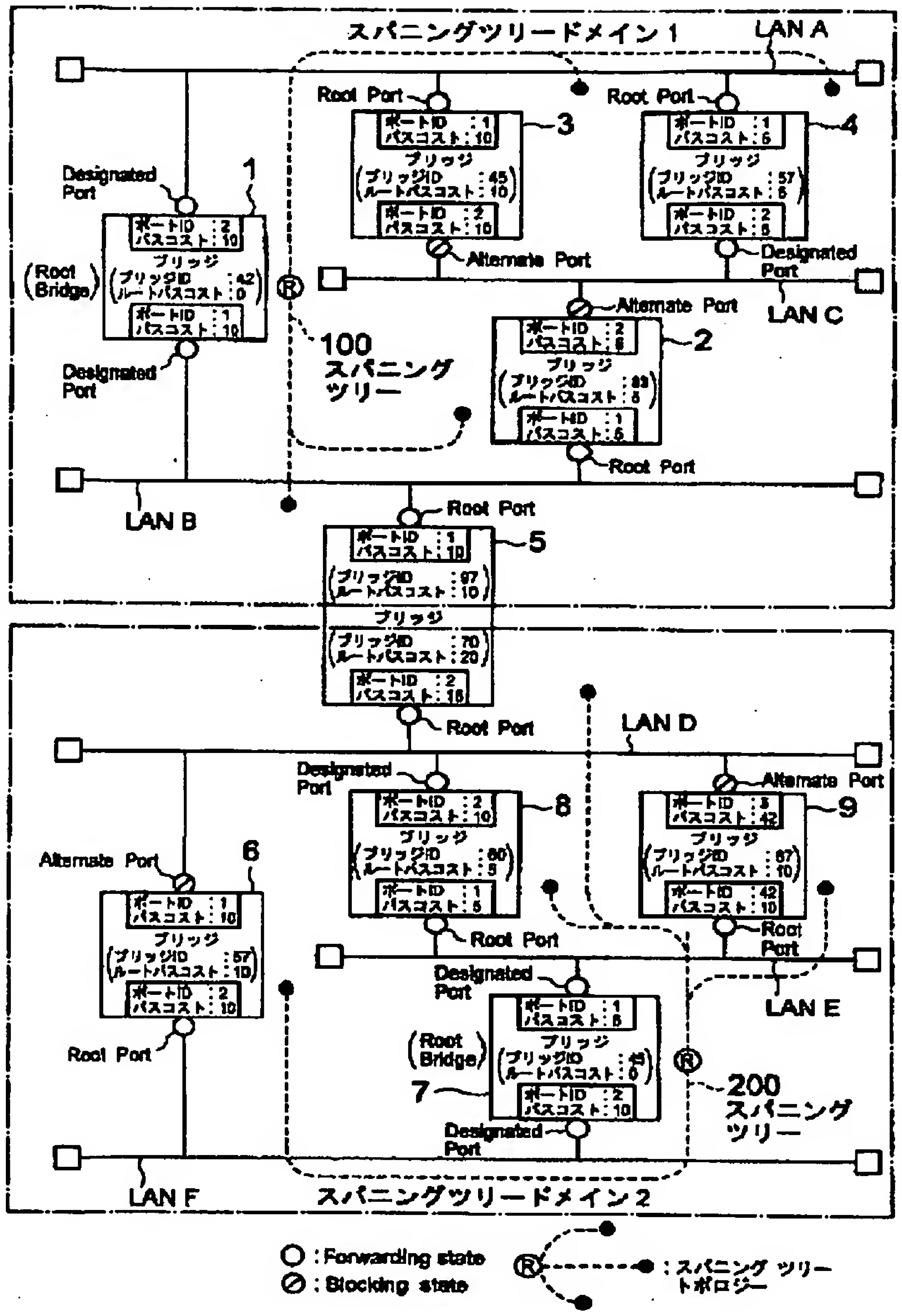

スタート
C-BPDU受信
S1
S2
ルートID比較受信ルートID
>自ブリッジID
YES
NO
S3
ルートブリッジ
全てのポートをデジグネイテッドポート
としてC-BDPUを送信、
送信C-BPDU
ルートID=自ブリッジID
ルートパスコスト=0
ブリッジID=自ブリッジID
S4
デジグネイテッドブリッジ
S5
全ポートの受信
ルートID比較
最小値受信
ポート
他ポート
S6
最小ブリッジIDを受信して
いるポートは複数あるか
NO
YES
S7
該当ポートの受信
パスコスト比較
最小値受信
ポート
他ポート
S8
最小パスコストを受信して
いるポートは複数あるか
NO
YES
S9
該当ポートの受信
ブリッジID比較
最小値受信
ポート
他ポート
S10
ルートポート
該当ポートからC-BPDU
の送信停止
S11
受信ルートID
<送信ルートID
各ポートの受信ルートID,
送信ルートIDの比較
受信ルートID>送信ルートID
受信ルートID=送信ルートID
受信パスコスト
<送信パスコスト
各ポートの受信パスコスト,
送信パスコストの比較
受信パスコスト>送信パスコスト
S12
受信パスコスト=送信パスコスト
S13
各ポートの受信ブリッジID
>自ブリッジID
YES
NO
S14
デジグネイテッドポート
C-BPDUを以下の値とし送信
ルートID=受信ルートID
ルートパスコスト=
受信ルートパスコスト+パスコスト
ブリッジID=自ブリッジID
S15
オールタネートポート
該当ポートからC-BPDU
の送信停止

[Drawing 9]

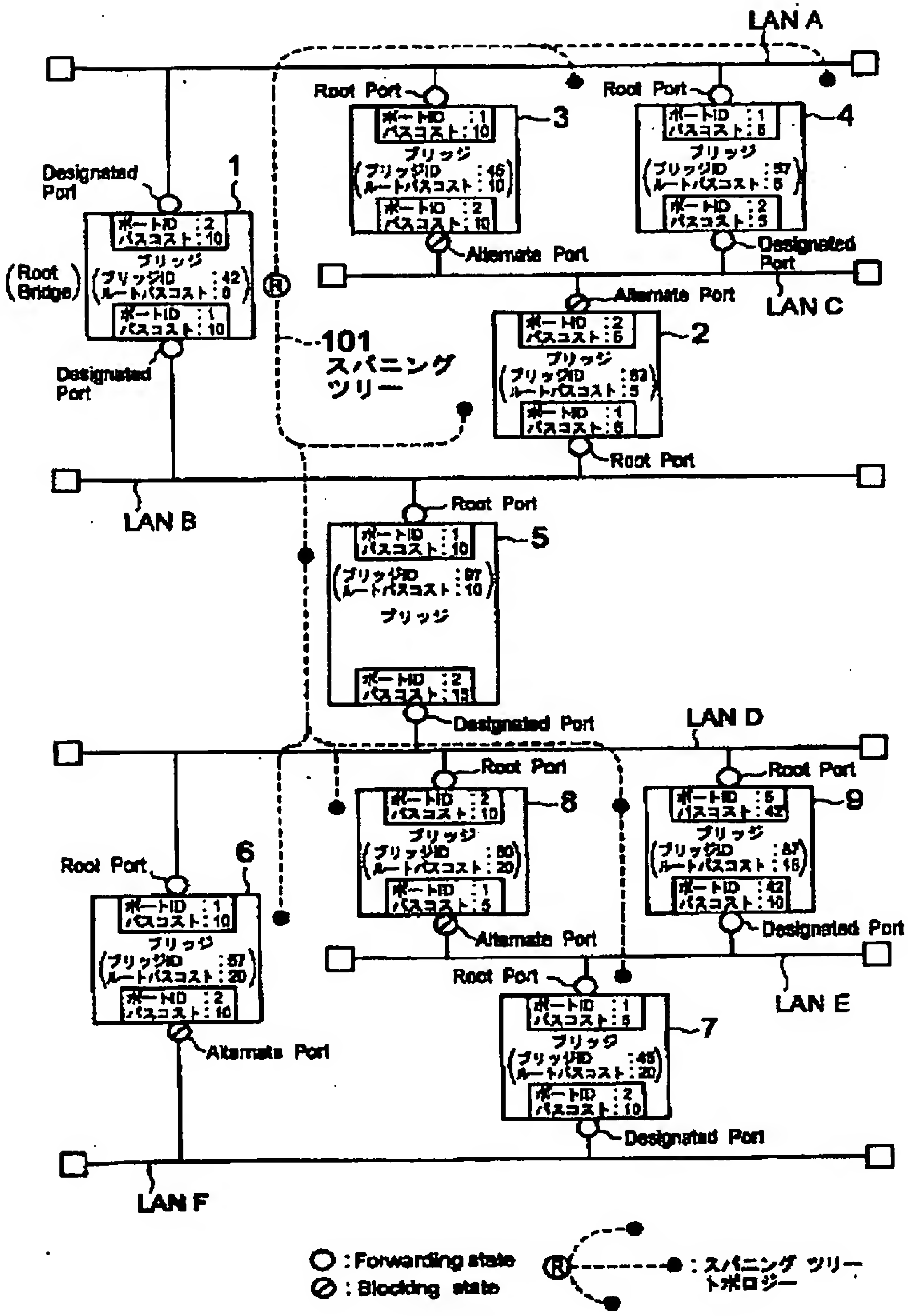

41リング
ブリッジ1-1
111スパニングツリー
ブリッジ1-2
スパニングツリー
112
ブリッジ1-4
ブリッジ30
ブリッジ2-1
ブリッジ3-1
113スパニングツリー
ブリッジ2-2
ブリッジ3-2
42
リング
ブリッジ1-3
ブリッジ20
ブリッジ3-3
ブリッジ2-3
ブリッジ3-5
ブリッジ2-5
ブリッジ3-4
ブリッジ2-4
43リング

[Drawing 8]

(13)


スパニングツリードメイン1
LAN A
Root Port
Root Port
3
4
ポートID :1
パスコスト :10
ブリッジ
ブリッジID :45
ルートパスコスト :10
ポートID :2
パスコスト :10
ポートID :1
パスコスト :5
ブリッジ
ブリッジID :57
ルートパスコスト :5
ポートID :2
パスコスト :5
Designated Port
1
ポートID :2
パスコスト :10
ブリッジ
Root Bridge
ブリッジID :42
ルートパスコスト :0
ポートID :1
パスコスト :10
Designated Port
Alternate Port
Designated Port
LAN C
Alternate Port
2
ポートID :2
パスコスト :5
ブリッジ
ブリッジID :83
ルートパスコスト :5
ポートID :1
パスコスト :5
Root Port
100
スパニングツリー
LAN B
Root Port
5
ポートID :1
パスコスト :10
ブリッジID :97
ルートパスコスト :10
ブリッジ
ブリッジID :70
ルートパスコスト :20
ポートID :2
パスコスト :15
Root Port
LAN D
Designated Port
8
ポートID :2
パスコスト :10
ブリッジ
ブリッジID :60
ルートパスコスト :5
ポートID :1
パスコスト :5
Alternate Port
9
ポートID :3
パスコスト :42
ブリッジ
ブリッジID :67
ルートパスコスト :10
ポートID :42
パスコスト :10
Alternate Port
6
ポートID :1
パスコスト :10
ブリッジ
ブリッジID :57
ルートパスコスト :10
ポートID :2
パスコスト :10
Root Port
Root Port
Root Port
Designated Port
LAN E
7
ポートID :1
パスコスト :5
ブリッジ
Root Bridge
ブリッジID :45
ルートパスコスト :0
ポートID :2
パスコスト :10
Designated Port
200
スパニングツリー
LAN F
スパニングツリードメイン2
○ : Forwarding state
⊘ : Blocking state
R : スパニング ツリー トポロジー

[Drawing 10]


LAN A
Root Port
ポートID : 1
パスコスト : 10
ブリッジ
ブリッジID : 46
ルートパスコスト : 10
ポートID : 2
パスコスト : 10
3
Root Port
ポートID : 1
パスコスト : 5
ブリッジ
ブリッジID : 57
ルートパスコスト : 5
ポートID : 2
パスコスト : 5
4
Designated Port
1
ポートID : 2
パスコスト : 10
ブリッジ
(Root Bridge)
ブリッジID : 42
ルートパスコスト : 0
ポートID : 1
パスコスト : 10
Designated Port
Ⓡ
Alternate Port
Designated Port
LAN C
Alternate Port
ポートID : 2
パスコスト : 5
ブリッジ
ブリッジID : 82
ルートパスコスト : 5
ポートID : 1
パスコスト : 5
2
Root Port
101
スパニング
ツリー
LAN B
Root Port
ポートID : 1
パスコスト : 10
5
ブリッジID : 97
ルートパスコスト : 10
ブリッジ
ポートID : 2
パスコスト : 15
Designated Port
LAN D
Root Port
ポートID : 2
パスコスト : 10
ブリッジ
ブリッジID : 80
ルートパスコスト : 20
ポートID : 1
パスコスト : 5
8
Alternate Port
Root Port
ポートID : 5
パスコスト : 42
ブリッジ
ブリッジID : 87
ルートパスコスト : 15
ポートID : 42
パスコスト : 10
9
Designated Port
LAN E
Root Port
6
ポートID : 1
パスコスト : 10
ブリッジ
ブリッジID : 57
ルートパスコスト : 20
ポートID : 2
パスコスト : 10
Alternate Port
Root Port
ポートID : 1
パスコスト : 5
ブリッタ
ブリッジID : 45
ルートパスコスト : 20
ポートID : 2
パスコスト : 10
7
Designated Port
LAN F
○ : Forwarding state
⊘ : Blocking state
Ⓡ
● : スパニング ツリー トポロジー

[Translation done.]

(15)